

EXAMINER'S AMENDMENT

1. The Information Disclosure Statement filed 12 December 2005 is objected to as the reference US 2003/159516 is an improper reference citation. First, it is improper, because Applicant cited "an equivalent of WO 02/04135" underneath the citation. This statement is better placed in the remarks accompanying the IDS, not in the IDS itself, and especially not in a place where merely Document Numbers are meant to be cited. It is also improper as the reference number itself is incorrect. The correct reference number is US 2003/0159516. For the purposes of furthering the prosecution, the proper reference has been considered and has been listed on the enclosed PTO-892 form.

2. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it **MUST** be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Ross F. Hunt, Jr. on 26 March 2008.

3. The application has been amended as follows:

Please rewrite claim 4 as follows:

4. (Currently Amended) A transducer according to claim 3, wherein the apertures comprise a plurality of parallel slots in the wear plate and the slots are located below the boundaries between adjacent magnets.

In claim 5, line 3, change "wav" to --wave--.

In claim 9 line 3, change "section" to --sections--.

Please cancel claim 10.

Please rewrite claim 16 as follows:

16. (Currently Amended) A method according to claim 11, wherein the DC magnetic field is applied by a magnetic means comprises comprising at least one magnet and the AC magnetic flux is provided by an electrical winding comprising ~~comprises~~ a meander coil between

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the at least one magnet of the magnetic means and the wear plate, the meander coil having a plurality of straight sections interconnected by meanders.

4. The following is an examiner's statement of reasons for allowance: The prior art of record fails to teach and/or suggest an electromagnetic acoustic transducer for exciting ultrasound in a material under test, the transducer comprising magnetic means for applying a DC magnetic field to the material under test, an electrical coil supplied by an alternating current source for providing an AC magnetic flux within the material under test, and a wear plate adapted to engage with and slide along the surface of the material under test, characterized in that the wear plate comprises an electrically conductive, ferromagnetic material having apertures therein configured to provide electrical and magnetic discontinuity in the wear plate and to permit penetration of both the DC magnetic field and the AC magnetic flux into the material under test so as to create, by their interaction, ultrasonic vibration of the material under test.

The prior art of record also fails to teach and/or suggest a method of exciting ultrasound in a material under test, using an electromagnetic acoustic transducer, the method comprising: applying a DC magnetic field to the material under test, providing an AC magnetic flux within the material under test, and causing a wear plate to engage with and slide along the material under test; characterized in that: the wear plate comprises an electrically conductive, ferromagnetic material having apertures therein which provide electrical and magnetic discontinuity in the wear plate; whereby both the DC magnetic field and the AC magnetic flux penetrate into the material under test, and ultrasonic vibration of the material under test occurs due to the interaction of the DC magnetic field and AC magnetic flux.

The closest prior art is that of **Böttcher et al. (US 4,149,421)**, **Hüschelrath et al. (US 4,665,752)**, **Buttram et al. (US 6,125,706)**, and **Hübschen (US 6,766,694 B2)**. **Böttcher et al.** teaches controlling the eddy currents produced in a test object by an EMAT with an electrically conductive metal shield with a single or double aperture placed between the EMAT and the test object. However, **Böttcher et al.** does not teach utilizing the shield as either a wear plate or part of a wear plate in order to protect the components of the EMAT. **Hüschelrath et al.** discloses a protective metal end cap 20 with radially running slots to prevent to formation of eddy currents in the end cap and with an optional sapphire layer to directly contact the test object. There is no teaching in **Hüschelrath et al.** of the metal of the cap being a ferromagnetic metal such that the

DC magnetic field can penetrate the cap and interact with the test object. **Buttram et al.** teaches utilizing holes in the wear plate merely for allowing the gas cooling the EMAT to escape and to keep the cooling gas flowing around the inside of the EMAT. **Hübschen** teaches utilizing a ferromagnetic coil support in order to increase the distance between the EMAT magnets and coils and to protect the transducer against wear as the transducer doesn't actually touch the surface of the test object. Therefore, there is no teaching and/or suggestion in the prior art to provide an EMAT with a wear plate comprising an electrically conductive, ferromagnetic material having apertures therein configured to provide electrical and magnetic discontinuity in the wear plate and yet to permit the penetration of both the DC magnetic field and the AC magnetic flux into the material under test while protecting the magnetic and coil components of the EMAT as the EMAT is moved along the surface of a test object.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

5. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Böttcher et al. (US 4,149,421) discloses a device for ultrasonically checking material by means of an electrodynamic converter which includes a metallic foil shield (23) between the coil (12) and the test object (11).

Hüschelrath et al. (US 4,665,752) discloses an electrodynamic transducer with an end cap (20) with radial slots in order to prevent the formation of eddy currents.

Davidson et al. (US 5,537,876) discloses an apparatus and method for the nondestructive evaluation of butt welds which includes utilizing EMATs with a wear plate comprising a layer of abrasive resistant titanium (70) and a sliding layer of UHMW plastic (72).

MacLauchlan et al. (US 5,684,406) discloses an electromagnetic acoustic transducer with an electrostatic shield (54) between the wear plate (52) and the coil (50).

Buttram et al. (US 6,125,706) discloses a high temperature electromagnetic acoustic transducer with holes in the wear plate in order to allow for the circulation of a cooling gas through the EMAT.

Kwun et al. (US 6,404,189 B2) teaches utilizing an EMAT/magnetostrictive probe to inspect pipelines from an in-line inspection vehicle.

Böhnke (US 6,546,107 B1) teaches using a magnetic cover with a number of openings on a microphone in order to provide the microphone with a predetermined strength or stiffness while letting through a predetermined sound pressure.

Hübschen (US 6,766,694 B2) teaches using a ferromagnetic coil support in an EMAT in order to lift the transducer off the test surface in order to reduce the wear on the EMAT and yet allow the EMAT to function at a high sensitivity.

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to ROSE M. MILLER whose telephone number is (571)272-2199. The examiner can normally be reached on Monday - Friday, 8:00 am to 4:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Hezron Williams can be reached on 571-272-2208. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/R. M. M./
Examiner, Art Unit 2856
27 March 2008
/Hezron Williams/
Supervisory Patent Examiner, Art Unit 2856